Öko-Institut e.V.
Institut für angewandte Ökologie
Institute for Applied Ecology

Challenges for the accounting of carbon removals

Options for the definition of CDR in EU climate targets

Wolfram Joerss

Expert workshop on the EU 2040 Climate Target:
The role of carbon removals

Brussels, 28 February 2024

Overview

1) CRCF removals ≠ Inventory negative emissions (CO_2 removal / CO_2 recovery)
   - Only CRCF to consider environmental integrity of removal activities
2) GHG inventory (not CRCF registry!) is key for measuring CDR contribution to EU NDC
3) Minimum targets for CDR as complementary or subordinate targets to emission reduction targets?
   - to avoid double-counting, complementary CDR target must be inventory-based
   - Subordinate CDR target could be CRCF-based
4) Ceiling for maximum CDR contributions (to avoid mitigation deterrence) must be inventory-based
5) Admission of CRCF units into ETS leads to double-counting with ‘ESR 2040’ / ‘LULUCF 2040’
   - requires reflection in ESR/LULUCF 2040 target ambition to safeguard performance for ECL/NDC ambition
6) Inventory system not yet ready for full reflection of CDR activities (and e-fuels)
   - Methodologies (IPPC) & reporting tables (UNFCCC)
   - International agreement (2027 IPCC methodology report) decisive for contribution of imported e-fuels to domestic NDC achievement

CDR in inventories and EU targets

How would removals be accounted for in the 2030 EU target architecture?

	CRT category	EU target architecture		EU NDC
UNFCCC national total	**1 Energy** 1.A Fuel Combustion 1.B Fugitive emissions from fuels 1.C CO_2 transport and storage	ETS1	ESR	✓
	2 IPPU (Industrial Processes and Product Use)	ETS1	ESR	✓
	3 Agriculture	ESR		✓
	4 LULUCF (Land Use, Land Use Change and Forestry)	LULUCF-Reg.		✓
	5 Waste	ESR		✓
	6 Other (so far not used by any EU MS)	×		×
UNFCCC memo items	1.D.1 International bunkers	partly in ETS1		✓
		×		×
	1.D.3 CO_2 emissions from biomass (removals & emissions covered in LULUCF of biomass production country)	×		×

- Allocation to inventory categories matters!
- CRT 6 ‘Other’ is likely candidate for reporting DACCS removals (& DACCU)
  - ESR Art 2 scope definition excludes CRT 6
  - ESR MRV definition under Governance Reg includes CRT 6
    ESR = UNFCCC national total without LULUCF – 1.A.3.a domestic aviation – ETS1 (stationary)
    (Annex XV of Commission Implementing Regulation 2020/1208)
  - EU NDC scope excludes CRT 6
  - Coverage of CRT 6 in NDC & ESR to be revisited for post-2030 as DACCS may become quantitatively relevant
- Perverse incentive to rely on imported biomass

Inventory allocation of CDR options (I)

CDR typology		CDR processes	GHG inventory coverage	
Conventional CDR on land	Nature-based	▪ **Afforestation / reforestation; improved forest management; agroforestry** ▪ **Soil carbon sequestration** ▪ **Peatland and wetland restoration** ▪ **durable HWPs** (harvested wood products)	emissions & removals	**CRT 4 LULUCF**
Novel CDR	Nature-based	▪ **Blue carbon** / coastal wetland management	emissions & removals	**CRT 4 LULUCF**
		▪ **Durable non-wood biomass products** (e.g. construction materials addressed in CRCF)	gross 'removal' during product generation	**??** Would require additional carbon pool in LULUCF
			gross emission at end of life	

LULUCF: **availability of IPCC methodologies & CRT reporting options** do not safeguard **availability of data** to support higher tier / accurate reporting

Inventory allocation of CDR options (II)

CDR typology		CDR processes	GHG inventory coverage	
Novel CDR	Industrial / engineered CDR on land	**BioCCS** ▪ BECCS (bioenergy) ▪ CO2 from biomass fermentation	removal during biomass growth	CRT 4 LULUCF
			emission during biomass harvest	CRT 4 LULUCF
			CO_2 recovery	CRT 1,2 (energy, IPPU) gap in CRT 5 waste
			CO_2 losses during transport & storage	CRT 1.C
		BioCCU / BECCU	gross removal / emissions during biomass growth & harvest	CRT 4 LULUCF
			CO_2 recovery for product generation	??, possibly CRT 1,2 (energy, IPPU) & possibly CRT 5 waste
			gross emission at end of life	?? possibly CRT 1,2,3 or 5
		DACCS	Gross removal during carbon capture	?? possibly CRT 6
			CO_2 losses during transport & storage	CRT 1.C
		DACCU	gross removal for product generation	?? possibly CRT 6
			gross emission at end of life	?? possibly CRT 1,2,3 or 5

Novel industrial CDR on land:

- gross removals & emissions often spread across several inventory categories and inventory years
- In CRT tables: CO_2 recovery for CCU not separated from CO_2 recovery for CCS!

Inventory allocation of CDR options (III)

CDR typology		CDR processes	GHG inventory coverage	
Novel CDR	Industrial / engineered CDR on land	Biochar	removal during biomass growth	CRT 4 LULUCF
			emission during biomass harvest	CRT 4 LULUCF
			CH_4 emissions during biochar production	CRT 1.B
			Gross removal on application in soils	CRT 4 LULUCF
		Enhanced weathering (**EW**) ▪ on soils ▪ Treatment of demolished concrete / concrete maturing	Gross removal	??
			Gross emissions for grinding of rock & transport	CRT 1 & 2
	Engineered Ocean CDR	▪ Fertilisation ▪ Alkalinisation ▪ Artificial upwelling	Associated gross removals and emissions	?? Outside territorial scope of national inventories!?

Nature-based CDR ≠ LULUCF

Biochar production is industrial process, gross removals reported in LULUCF

Summary of inventory challenges

- **LULUCF**: data for granular methodologies?
- **LULUCF beyond nature-based CDR**: biochar…
- **Industrial CDR**:
  emissions / removals spread over different inventory categories,
  subject to separate EU instruments / targets
- **Industrial CDR** involving biomass/**wood** (BECCS, biochar):
  removal / emission / recovery spread over different inventory years
- **DACCS, EW**: inventory categories & methodologies to be defined
- **CCU (DACCU/BECCU):** concept for circular carbon flows missing,
  E-fuel emission allocation to carbon origin or point of combustion? High net relevance for international trade!
  Recovery for CCU jointly reported with recovery for CCS
- **Ocean CDR**: out of scope for territorial principle of GHG inventories?

Upcoming developments:

- IPCC (2024)(1) decided to
  'hold an Expert Meeting on Carbon Dioxide Removal Technologies, Carbon Capture Utilization and Storage and provide a Methodology Report on these by the end of 2027'
- Acknowledgement of 2027 IPCC report & changes to CRT to be adopted by UNFCCC / CMA for post-2030

(1) Decision IPCC-LX- 9, https://www.ipcc.ch/site/assets/uploads/2024/02/IPCC-60_decisions_adopted_by_the_Panel.pdf

Removal quantification approaches in CRCF & GHG inventory

CRCF	GHG inventory
Projects, can involve **value chains**	Source principle, single process steps: gross removals, emissions & recoveries separately
Permanence relevant	**Permanence not relevant** removal in year X can be re-emitted in X+1
Certified removal unit: **Additional** benefit **compared to baseline** **Net** carbon removal benefit = $\mathbf{Removal_{Project} - Removal_{Baseline} - Emissions_{associated}}$	'absolute' **gross removals** & emissions, no baseline: $\mathbf{Removal_{Project}}$ **&** $\mathbf{Emissions_{associated}}$ Possibly in separate national scopes / categories / years
Conservativeness: subtract uncertainties	**Accuracy**: always best guess, quantify uncertainties for prioritisation of inventory improvements
Project-specific MRV approaches using **granular data**, consistent to highest-tier inventory methodologies	In practice: application of low-tier methodologies due to lack of consistent data on national level
„QU.A.L.ITY" criteria aim to safeguard **environmental integrity**	**Environmental integrity not relevant** ‚reporting integrity' (TACCC principles)

- **High-tier**, highly granular **inventory**: **1 t CRCF net removal** benefit reflected by **1+x t gross inventory removals**
- **Low-tier**, less granular **inventory**: **1 t CRCF net benefit not at all** reflected **in GHG inventory**

(1) Decision IPCC-LX- 9, https://www.ipcc.ch/site/assets/uploads/2024/02/IPCC-60_decisions_adopted_by_the_Panel.pdf

CRCF units in EU target architecture (I)

- CRCF units cannot directly contribute to the **EU NDC**!
  - Removals contribute to NDC via inventory! Avoid Double-counting!
  - Exception (post-2050): extra-territorial Ocean CDR if explicitly added to NDC definition
- **Minimum targets** for (industrial) CDR deployment at EU or MS level?
  - **complementary** CDR **target option**
    (new 'industrial CDR' sector, next to ETS1, 'ESR 2040' & 'LULUCF 2040')
    - MUST be defined via inventory categories to avoid double-counting
    - Highly complex & hindered by outstanding IPCC methodology clarifications
  - **subordinate** CDR **target option**
    (like energy efficiency or renewable energy targets)
    - Definition could make use of CRCF units / CRCF methodologies,
    - Double-counting to 'superior' ETS1 / 'ESR 2040' / 'LULUCF 2040' targets does no harm
    - advantage in environmental integrity

CRCF units in EU target architecture (II)

- Ceiling for **maximum** (industrial) **CDR** contribution?
  - to avoid mitigation deterrence,
    like 225 Mt ceiling set out in ECL for net LULUCF contribution to EU 2030 55% target
  - Definition MUST be inventory-based, not feasible using CRCF units
    - decisions on selection of targeted (industrial) CDR options to be taken
    - ceiling for gross inventory removals / recoveries
    - in absence of international guidance, EU could develop internal rules under Governance Regulation on details of inventory allocation and more granular reporting tables
      (for complementary CDR minimum target option, too)
- CRCF units in the **EU-ETS**?
  - mind double-counting of removals!
    - for ‘ESR 2040’ or ‘LULUCF 2040’ target via inventory
    - for ETS1 target via certificate
    - To be reflected in target ambition for ‘ESR 2040’ and/or ‘LULUCF 2040’
      to safeguard joint ETS / ESR / LULUCF performance for overall ECL / NDC ambition
  - Permanence & emission deterrence matters!

Conclusions

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2) GHG inventory (not CRCF registry!) is key for measuring CDR contribution to EU NDC
3) Minimum targets for CDR as complementary or subordinate targets to emission reduction targets?
   - to avoid double-counting, complementary CDR target must be inventory-based
   - subordinate CDR target could be CRCF-based
4) Ceiling for maximum CDR contributions must be inventory- based
   - could be combined with 'subordinate' CRCF-based target option for minimum industrial CDR targets
5) Admission of CRCF units into ETS leads to double-counting with 'ESR 2040' / 'LULUCF 2040'
   - requires reflection in ESR/LULUCF 2040 target ambition to safeguard performance for ECL/NDC ambition
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Your contact

Wolfram Joerss
Senior Researcher

Oeko-Institut e.V.
Office Berlin
Borkumstr. 2
13189 Berlin
Germany

Phone: +49 30 405085-328
mail: w.joerss@oeko.de

Thank you for your attention!

- Do you have any questions?

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